



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,056	07/09/2003	Gab-Jin Nam	5649-1073	9528
20792	7590	09/16/2005	EXAMINER	
MYERS BIGEL SIBLEY & SAJOVEC PO BOX 37428 RALEIGH, NC 27627			BLUM, DAVID S	
			ART UNIT	PAPER NUMBER
			2813	
DATE MAILED: 09/16/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/616,056

**Applicant(s)**

NAM ET AL.

**Examiner**

David S. Blum

**Art Unit**

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 June 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-13, 63, 78, 95-109 and 111-136 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-13, 63, 95-109, 111-118 and 120 is/are allowed.
- 6) ☒ Claim(s) 78, 119, 121, 122 and 124-136 is/are rejected.
- 7) ☒ Claim(s) 133 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- \* 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some    \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)                        |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____   |

Art Unit: 2813

This action is in response to the amendment filed 6/29/05.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 124 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 124 limits the titanium density of the second layer to be higher than or equal to the titanium density of the first layer (0.1-15percent), but claim 124 recites limitations that are below that of the limitations of claim 78. the instant specification does not teach how to make the density of the titanium in the second layer both, equal or greater than that of the first layer and also be lower than that of the first layer.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 2813

Claims 121 and 135 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: toward the density of the titanium content. These claims contain the limitation "...the density of titanium in the dielectric layer depends upon the thickness of the dielectric layer...". Although the instant specification further teaches that the density of titanium in the dielectric layer (or layers) is varied within the layer or between layers, it is unclear how the density of titanium in the dielectric layer depends upon the thickness of the dielectric layer in these claims (metes and bounds).

### ***Claim Objections***

4. Claims 121 and 135 are objected to because of the following informalities: Both claims recite 760mTorr. It is believed the claims should read 760mmTorr. Appropriate correction is required. If this should read 760mmTorr, please make corrections within the specification.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

Art Unit: 2813

only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 78, 121-122, 125-132, and 134-136 are rejected under 35 U.S.C. 102(b) as being anticipated by Shih (US 006640403).

Shih teaches all of the positive steps of claims 78, 121-122, 125-132, and 134-136 as follows.

Regarding claim 78, Shih forms a lower electrode (conductive layer 110), a reaction suppressing layer (112) on the lower electrode, a tantalum titanium oxide layer (114) on the upper layer of the reaction suppressing layer, applies a thermal process on the tantalum titanium layer (column 3 line 51-53), and forms an upper electrode (116) on the tantalum titanium layer. Shih teaches the density (concentration) of titanium to be 5-15 percent (0.05-0.15 column 2 line 41) as in the claim. Regarding the two steps of depositing the tantalum/titanium layer, the limitations of the claim recite that the two layers may have the same titanium density, thus the two layers may be identical. This then reads on separating one deposition step of Shih into two identical deposition steps. The mere duplication of parts, or in this case the duplication of process steps to form the duplicate parts does not represent novelty, but rather, once Shih teaches the process for forming a tantalum/titanium layer, its duplication is obvious.

In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) (Claims at issue were

Art Unit: 2813

directed to a water-tight masonry structure wherein a water seal of flexible material fills the joints which form between adjacent pours of concrete. The claimed water seal has a "web" which lies perpendicular to the workface and in the joint, and a plurality of "ribs" which are parallel to the workface, forming the following shape:

The prior art disclosed a flexible water stop for preventing passage of water between masses of concrete in the shape of a plus sign (+). Although the reference did not disclose a plurality of ribs, the court held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced.).

Regarding claim 125, the density of the second tantalum titanium film is 5-15 percent (column 2 line 41).

Regarding claim 126 the reaction suppressing film is silicon nitride (column 2 line 39).

Regarding claim 127, the reaction suppressing layer is applied by rapid thermal nitridation (column 2 line 47).

Regarding claim 128, the reaction suppressing layer is formed by chemical vapor deposition (column 2 line 46).

Regarding claim 129, a titanium precursor, a tantalum precursor, and oxygen gas are supplied separately to a reactor and reacted to each other (column 2 lines 52-65).

Art Unit: 2813

Regarding claim 130, the tantalum precursor is a metal alkoxide (alkoxy, column 2 line 58).

Regarding claim 131, the titanium precursor is  $\text{Ti}(\text{C}_3\text{H}_7\text{O})_2$  equivalent to a compound such as  $\text{Ti}(\text{OCH}(\text{CH}_3)_2)_4$ . (column 2 lines 59-63).

Regarding claim 132, the two precursors are mixed outside the reactor (column 2 lines 62-64, mixing box) and are sent to the reactor (showerheads 50 to place gases into reactor).

Regarding claim 134, Shih teaches controlling the density of the titanium, and also teaches controlling the temperature and gas flow rate (vaporizing temperatures and decomposition temperatures are also listed) suggesting the flow rates and temperatures affect the product composition, thus controlling the density of the titanium.

Regarding claim 135, the dielectric layer is formed at 400 degrees C (column 3 line 59) and at a pressure of 1 torr (figure 4), 1 torr=1 mmHg at 0 degrees C. (claim reads 100-760mTorr at 100-700 degrees C. It is believed the "m" should be "mm").

Art Unit: 2813

Regarding claim 136, the tantalum and titanium precursor are provided at a rate of 5-200mg/min (figure 4 in gas flow rate (sccm) rather than (mg/min).

Regarding claim 121, Shih forms a lower electrode (conductive layer 110), a reaction suppressing layer (112) on the lower electrode, a tantalum titanium oxide layer (114) on the upper layer of the reaction suppressing layer, applies a thermal process on the tantalum titanium layer (column 3 line 51-53), and forms an upper electrode (116) on the tantalum titanium layer. Shih teaches the density (concentration) of titanium to be 5-15 percent (0.05-0.15 column 2 line 41) as in the claim. Regarding the limitation as to the density of titanium depends upon the thickness of the layer, there are no limitations as to how the density of the titanium depends upon the thickness. Therefore, as Shih teaches a concentration (in the range of the instant claim) and a thickness, its titanium density depends upon the thickness of the layer. The tantalum and titanium precursors are mixed in chamber 40 and then supplied to the reactor. The dielectric layer is formed at 400 degrees C (column 3 line 59) and at a pressure of 1 torr (figure 4), 1 torr=1 mmHg at 0 degrees C. (claim reads 100-760mTorr at 100-700 degrees C. It is believed the "m" should be "mm").

Regarding claim 122, the tantalum and titanium precursor are provided at a rate of 5-200mg/min (figure 4 in gas flow rate (sccm) rather than (mg/min).

***Claim Rejections - 35 USC § 103***



Art Unit: 2813

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 124 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shih (US006640403).

Shih teaches all of the positive steps of claim 124 as recited above in regard to claim 118 above except for the specific titanium density of the second layer.

Regarding claim 124, the density of the second tantalum titanium film is 5-15 percent (column 2 line 41). As the instant specification teaches up to 20 percent, this is a matter of optimization as recited below.

These ranges are considered to involve routine optimization while it has been held to be within the level of ordinary skill in the art. As noted in *In re Aller* (105 USPQ233), the selection of reaction parameters such as temperature and concentration would have been obvious:

"Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art. Such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

*In re Aller* 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmscher* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ

Art Unit: 2813

372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

One skilled in the requisite art at the time of the invention would have used any ranges or exact figures suitable to the method in the process of regarding concentrations (density of constituent), temperature and pressure using prior knowledge, experimentation, and observation with the apparatus used in order to optimize the process and produce the film desired to the parameters desired.

***Allowable Subject Matter***

9. Claims 1-13 are allowed.

10. The following is an examiner's statement of reasons for allowance:

Claim 1 limits the formation of an electronic device to forming two layers of tantalum titanium oxide on a reaction suppressing layer where the two layers have different densities of titanium. This limitation, in combination with the other limitations of claim 1 is not taught or suggested by the prior art of record. Neither Shih (US 6640403) nor Chung (US006734480B2) teach or suggest altering the titanium content (density) within a layer or among consecutive layers.

Claims 2-13 are allowed as being properly dependent upon allowed claim 1.

Claim 63 limits the formation of an electronic device to forming a layer of tantalum titanium oxide on a reaction suppressing layer where the layer has a varying density of titanium. This limitation, in combination with the other limitations of claim 1 is not taught

Art Unit: 2813

or suggested by the prior art of record. Neither Shih (US 6640403) nor Chung (US006734480B2) teach or suggest altering the titanium content (density) within a layer or among consecutive layers.

Claims 111-118, 120, and 123 are allowed as being properly dependent upon allowed claim 63.

Claims 95 and 102 limit the formation of an electronic device to forming two portions of tantalum titanium oxide on a reaction suppressing layer where the two portions have different densities of titanium. This limitation, in combination with the other limitations of claim 1 is not taught or suggested by the prior art of record. Neither Shih (US 6640403) nor Chung (US006734480B2) teach or suggest altering the titanium content (density) within a layer or among consecutive layers.

Claims 96-97 are allowed as being properly dependent upon allowed claim 95.

Claims 98-100 and 102-109 are allowed as being properly dependent upon allowed claim 102.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Art Unit: 2813

11. Claim 133 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claim 133 limits the tantalum precursor to PET and the titanium precursor to TET. Shih (teaches precursors that are in the Markush group as taught in the instant specification, but not these specific precursors. Chung (US006734480B2) teaches using PET, but does not form a tantalum/titanium layer or suggest using TET.

12. Claim 119 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action. Claim 119 limits the tantalum precursor to PET and the titanium precursor to TET. Shih (teaches precursors that are in the Markush group as taught in the instant specification, but not these specific precursors. Chung (US006734480B2) teaches using PET, but does not form a tantalum/titanium layer or suggest using TET.

### ***Response to Arguments***

13. Applicant's arguments with respect to claims 78 and 119 have been considered but are moot in view of the new ground(s) of rejection.

Art Unit: 2813

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (571)-272-1687) and e-mail address is David.blum@USPTO.gov .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached at (571)-272-1702. Our facsimile number all patent correspondence to be entered into an application is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'D S Blum', with a long horizontal stroke extending to the right.

David S. Blum

September 14, 2005